

Spatially and Temporally Resolved Diagnostics of Dense Sprays Using Gated, Femtosecond, Digital Holography, Phase I

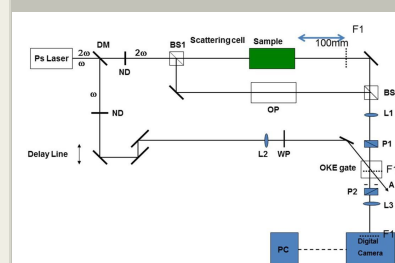
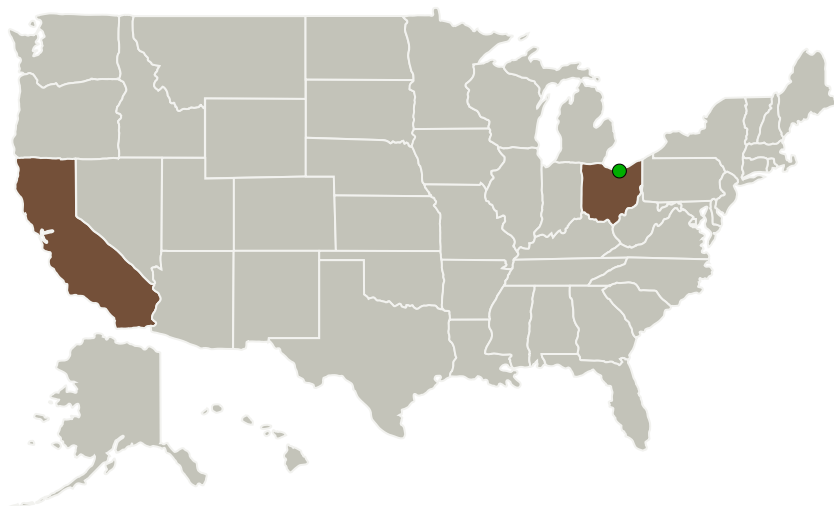
Completed Technology Project (2016 - 2016)



Project Introduction

This is a proposal to develop a unique, gated, picosecond, digital holography system for characterizing dense particle fields in high pressure combustion environments; a critical requirement clearly defined in the NASA solicitation. Most imaging methods fail to provide this capability because noise from multiple scattering buries the signal needed to acquire a useful image. Solutions to this problem are expensive, difficult to implement, and not ideal candidates for field experiments. The proposed innovation combines digital holography and picosecond, optical gating to limit the amount of optical noise sufficiently to enable high resolution, 3D imaging, effectively generalizing existing pseudo-ballistic imaging systems that have been used for imaging through dense particle fields. Storing the complete wavefront in a hologram enables use of a wide range of optical diagnostics methods including image processing and interferometry to improve image and information quality. The result is a new sensor concept that will be extremely useful in the experimental study of dense sprays and other particles fields, providing a detailed, instantaneous look at the structure and position of all of the particles as well as density field information in a large three dimensional sample volume. Moreover, the system can record dynamic information at high frequency.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
MetroLaser, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Laguna Hills, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

California	Ohio
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Project Transitions

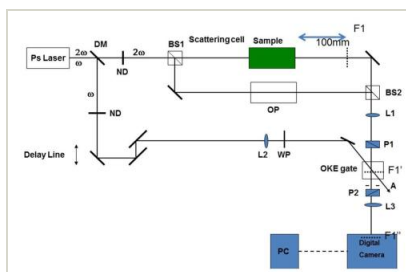
▶ **June 2016:** Project Start

✓ **December 2016:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139648>)

Images



Briefing Chart Image

Spatially and Temporally Resolved Diagnostics of Dense Sprays Using Gated, Femtosecond, Digital Holography, Phase I
(<https://techport.nasa.gov/image/133004>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

MetroLaser, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

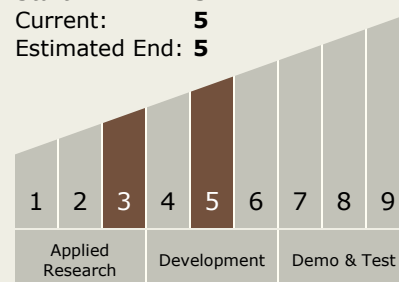
James D Trolinger

Technology Maturity (TRL)

Start: 3

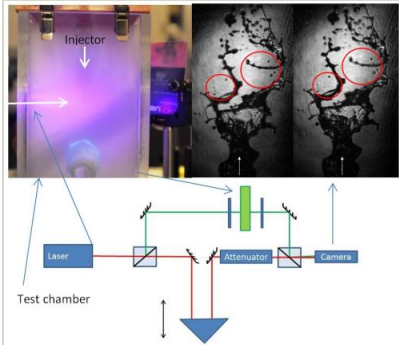
Current: 5

Estimated End: 5



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Final Summary Chart Image

Spatially and Temporally Resolved Diagnostics of Dense Sprays Using Gated, Femtosecond, Digital Holography, Phase I Project Image (<https://techport.nasa.gov/image/135291>)

Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.3 Aero Propulsion
 - └ TX01.3.5 Turbine Based Jet Engines

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System